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October 10, 1995

William F. Caton, Acting Secretary
Federal Communications Commission
1919 M Street, NW, Room 222
Washington, DC 20554

Re: Reply Comments of Hughes Communications, Inc., CC Docket No. 92-297

Dear Mr. Caton:

Enclosed please find an original and five copies of the Reply Comments of Hughes Communications, Inc. filed in the above-referenced proceeding.

If you have any questions concerning this matter, please do not hesitate to contact me.

Very truly yours,

Steven H. Schulman*
of LATHAM & WATKINS

Enclosure

* Admitted in Maryland only

W\WP51\

ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Rulemaking to Amend Parts 1, 2, 21, and 25	)	
of the Commission's Rules to Redesignate	)	CC Docket No. 92-297
the 27.5 - 29.5 GHz Frequency Band, to	)	
Reallocate the 29.5 - 30.0 GHz Frequency	)	
Band, to Establish Rules and Policies for	)	
Local Multipoint Distribution Service and	)	
for Fixed Satellite Services	)	

REPLY COMMENTS OF HUGHES COMMUNICATIONS, INC.

John P. Janka
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October 10, 1995

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SUMMARY

The 28 GHz band presents exciting new opportunities for emerging technologies, including geostationary orbit ("GSO") fixed satellite service ("FSS") systems, which will allow universal access to high-speed interactive services through small and affordable terminals. These GSO FSS systems, such as the GALAXY/SPACEWAY system proposed by Hughes Communications, Inc., will require access to 1000 MHz of 28 GHz spectrum to provide these services that will be essential to the National and Global Information Infrastructures. In order for the Commission's 28 GHz band plan to be successful, it must allow GSO FSS reasonable access to this spectrum. Critical to the success of the Commission's band plan are the terms and conditions under which the GSO FSS can access 250 MHz of the 1000 MHz that is proposed for it.

There is clear consensus that it is not feasible for the GSO FSS to share this 250 MHz (29.25-29.5 GHz) with feeder links for nongeostationary orbit mobile satellite systems ("NGSO MSS feeder links") under the Commission's "first-come, first-served" proposal. After the latest round of comments, it is equally clear that the only feasible and concrete solutions to this problem are the two options proposed by Hughes. The NGSO MSS feeder links/GSO FSS sharing solutions advanced by Motorola and TRW do not solve the problem. Motorola's proposal unjustifiably precludes other uses of the band, leaving the GSO FSS as a *de facto* secondary service in this 250 MHz. TRW's plan, while more constructive than Motorola's, is incomplete and therefore cannot serve as a basis for sharing at this time.

Absent the adoption of reasonable NGSO MSS feeder links/GSO FSS sharing criteria, Hughes's alternative proposals -- either to adopt reverse band working and free up the 29.25-29.5 GHz band for GSO FSS, or to increase the amount of spectrum that MSS feeder links and LMDS share -- remain the only feasible options before the Commission that would allow both the GSO FSS and NGSO MSS feeder links to meet their respective needs.

The Commission should reject the proposals of several commenters that the Commission adopt an artificial and fixed pairing of the downlink spectrum at 17.7-20.2 GHz with the 28 GHz uplink spectrum at 27.5-30.0 GHz. While "non-standard" band pairings may be useful and desirable for purposes of avoiding certain constraints in the downlink band, the Commission should not mandate which downlink bands are "paired" with the GSO FSS uplink bands. In light of the burdens already placed upon the GSO FSS by the Commission's band plan, the Commission should retain its present policy of allowing GSO FSS operators to choose the most advantageous downlink band.

The Commission should dismiss a number of new proposals that threaten the careful balance that has been struck in the proposed band plan. One commenter has now requested that the Commission allow MSS services to be provided in the 28 GHz uplink band. Hughes remains concerned that initiation of MSS service link operations in this band could effectively preclude GSO FSS operations. The Commission therefore should not license MSS service links in the 28 GHz band until co-frequency sharing between MSS and FSS services in the same band has been proven feasible.

Likewise, the Commission should dismiss the claim by terrestrial point-to-point microwave operators that the Commission has failed to provide any spectrum for their

services. While the proposed terrestrial services licensing rules may need to be altered slightly, the Commission has proposed to make available adequate spectrum for point-to-point services. Considering the 1000 MHz of spectrum available to terrestrial services, and the significant limitations that the Commission already has imposed on the GSO FSS, there is no need to consider further the proposals of fixed point-to-point operators that they should be able to share 500 MHz of the spectrum allocated to the GSO FSS on a co-primary basis.

In addition, there is no basis for reversing the Commission's conclusion that LMDS and GSO FSS cannot share the same spectrum. The comments of LMDS proponents offer no new hope on this issue. The Commission should reject the LMDS proponents' pleas to leave open the possibility of providing LMDS in spectrum currently allocated to GSO FSS. Like other service providers, GSO FSS operators need to be able to operate freely without the coordination complications presented by sharing spectrum with another service.

Finally, Hughes supports the unanimous position of the satellite industry that the Commission should first implement its traditional processing procedures to eliminate mutual exclusivity before subjecting satellite services to competitive bidding. Hughes also supports the proposal of most commenters that the Commission should wait until WRC-95 has concluded before adopting a band plan, as the decisions made at that conference will have a significant impact on the outcome of this proceeding.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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REPLY COMMENTS OF HUGHES COMMUNICATIONS, INC.

I. INTRODUCTION

Hughes Communications, Inc. ("Hughes") submits its Reply Comments in this proceeding.

The 28 GHz band (27.5-30.0 GHz) is the next frontier for geostationary orbit ("GSO") fixed satellite service ("FSS") systems and is unique in its ability to support the use of very small satellite antennas and the provision of high-speed, broadband interactive services. The Hughes GALAXY/SPACEWAY system, first proposed in 1993, is a GSO FSS system that takes advantage of the inherent capabilities of the 28 GHz band in order to offer a global network that is capable of providing the widest range of direct-to-home video and high-speed interactive services. Hughes's two-year-old vision for the 28 GHz band is now shared and confirmed by the dozen other GSO FSS applicants who have responded to the Commission's latest call for 28 GHz satellite applications.

Critical to GALAXY/SPACEWAY and many of these other GSO FSS systems is continued access to sufficient 28 GHz spectrum by very small antennas (i.e., 66 cm or 26

inches in diameter). At least 1000 MHz of the 28 GHz must be available for these so-called "VSATS" to provide adequate GSO FSS system capacity and to support the provision of competitively-priced satellite services.

When this proceeding started, the GSO FSS had access to 2.5 GHz of the 28 GHz band -- it is now down to 1000 MHz, 250 MHz of which is proposed to be shared with feeder links for the nongeostationary orbit mobile satellite service ("NGSO MSS"). As Hughes emphasized in its Comments, the success of the Commission's band plan hinges entirely on the terms under which GSO FSS VSATs will be allowed to share domestically the same 250 MHz of the 28 GHz band as NGSO MSS feeder links. The Comments filed by other satellite proponents, both GSO and NGSO alike, confirm Hughes's analysis that absent the adoption of some feasible method for the GSO FSS and NGSO MSS feeder links to share the same spectrum on a co-equal basis, the Commission will need to accommodate NGSO MSS feeder links in a manner that does not unduly constrain the operation of GALAXY/SPACEWAY and other GSO FSS systems in the 28 GHz band.

Below, Hughes replies to the NGSO MSS/GSO FSS sharing problem and other issues raised in the Comments in this proceeding.

II. RESOLUTION OF NGSO MSS FEEDER LINK/GSO FSS SHARING ISSUES IS CRITICAL TO THE BAND PLAN

The Comments in this proceeding confirm Hughes's analysis that the success of the Commission's band plan hinges entirely on resolution of the domestic sharing problems in the 29.25-29.5 GHz band presently proposed to be shared on a co-equal basis by NGSO MSS feeder links and GSO FSS systems. Each of Motorola, TRW and GE Americom agrees that sharing between presently proposed NGSO MSS feeder links and the GSO FSS is not possible absent the adoption of reasonable sharing criteria. However, the

only concrete solutions advanced so far that solve this problem are those that Hughes submitted in its Comments: either (i) adopt a reverse band working ("RBW") solution to meet the needs of at least one NGSO MSS feeder link applicant in the Ka band downlink band (at 19.4-19.7 GHz) and allow the GSO FSS access to the 29.25-29.5 GHz band without unreasonable restrictions; or (ii) slightly modify the band plan to increase the amount of NGSO MSS feeder link/LMDS sharing and thereby allow the GSO FSS to access 1000 MHz of the 28 GHz band without any overlap with NGSO MSS feeder links.

A. As Presently Proposed, NGSO MSS Feeder Links Cannot Share the 29.25-29.5 GHz Band With the GSO FSS

GSO FSS systems simply will be unable to utilize the 29.25-29.5 GHz band (representing 25% of the spectrum allocated to GSO FSS) if NGSO MSS systems are free to implement their feeder link segments on a first-come-first-served basis, as proposed by the Commission. Motorola states that "co-frequency, co-geographic sharing between the two types of services is not possible if an unrestricted number of FSS terminals, including VSATs, are allowed to operate in this shared spectrum."[1/] TRW also acknowledges that NGSO MSS feeder link/GSO FSS sharing cannot be accomplished unless appropriate interference mitigation techniques are employed.[2/] In short, nothing has been submitted to dispute Hughes's position that the Commission's current plan could eliminate planned GSO

1/ Comments of Motorola at 11.

2/ *See* Comments of TRW, Inc. at 24; *see also* Comments of GE Americom ("GE Americom") at 8-9 ("without sharing rules harmful interference is likely to result when a non-geostationary satellite passes between a GSO/FSS satellite and an earth station").

FSS use of 250 MHz of the 28 GHz band in exclusion zones which, combined, cover almost all 48 contiguous United States.[3/]

In response to the NSGO MSS feeder link/GSO FSS problem, each of Motorola and TRW has submitted a proposed solution. Motorola's proposal, however, is too vague to be taken seriously and fatally flawed in any event because it would unduly and unnecessarily constrain GSO FSS use of the 29.25-29.5 GHz band. While TRW recognizes the need for reasonable sharing conditions, its analysis is not complete enough to support a conclusion that its system can co-exist with GSO FSS systems in general. Absent the adoption of concrete and reasonable NGSO MSS feeder link/GSO FSS sharing criteria, Hughes's alternative proposals -- either to adopt reverse band working and free up the 29.25-29.5 GHz band for GSO FSS, or to increase the amount of spectrum that MSS feeder links and LMDS share -- remain at this point the only feasible options before the Commission that would allow both GSO FSS and NGSO MSS feeder link to have access to sufficient 28 GHz spectrum.

1. Motorola's Proposal Should Be Dismissed Out of Hand

In a pleading that is characteristically duplicitous, Motorola urges the Commission to "resist major changes" to the proposed band plan because the proposal in the Third Notice[4/] "involves a delicate balance among many diverse interests [and] any significant departures from the proposed rules might seriously disturb that balance."[5/] At

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[3/] *See* Comments of Hughes at 11-17.

[4/] Third Notice of Proposed Rulemaking and Supplemental Tentative Decision, FCC 95 287, released July 28, 1995 ("Third Notice").

[5/] Comments of Motorola at ii.

the same time, it urges the Commission to set aside 200 MHz of spectrum for Motorola's *exclusive* use and to adopt restrictions that would cripple the ability of the GSO FSS to use 25% of its 1000 MHz allocation for its intended purpose.

Motorola's proposal is as follows:[6]

- Motorola gets 200 MHz to use wherever it wants, however it wants.
- Motorola does not have to share its 200 MHz of feeder link spectrum with any other MSS system.
- The Commission should *disregard* its own proposal to make the GSO FSS and NGSO FSS feeder links co-primary in the 29.25-29.5 GHz band and instead should set aside 50 MHz of that band where Motorola would have "priority" over GSO FSS systems.[7]
- GSO FSS operators should be *precluded* from using anything other than "large" earth terminals in 250 MHz of the 28 GHz band (29.25-29.5 GHz).
- GSO FSS operators should be *constrained* to a "limited number" of earth stations in the shared 29.25-29.5 GHz band, located at "substantial distances" from each of the eight NGSO MSS feeder link sites that Motorola pre-selects at its own discretion.

Motorola's suggested sharing criteria are unreasonable and amount to nothing more than an attempt to make GSO FSS use of the 29.25-29.5 GHz band a *de facto* secondary use and also to preclude co-primary use of the band by TRW's Odyssey. Furthermore, Motorola ignores the incontrovertible fact that NGSO MSS satellite systems are uniquely capable of solving the NGSO MSS feeder link/GSO FSS interference problem and

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[6] *Id.* at 11-15.

[7] Motorola has been unwilling to date to coordinate with either other NGSO MSS feeder links or the GSO FSS; there is no reason to think it will do so after its system is licensed and in operation.

proposes to place the onus *solely* upon the GSO FSS providers to scale back their systems to comply with Motorola's unreasonable demands.

As a practical matter, even if one accepted Motorola's unfounded assertions, there would be no need to impose the types of constraints that it proposes: Motorola will get access to 150 MHz of spectrum through its sharing arrangement with LMDS, and it has indicated that the remaining 50 MHz that it requires will need to be used only for satellite initiation and control purposes at two locations in the U.S.[8/] TRW, which also seeks access to the 250 MHz of the "shared" band, does not require any such unreasonable constraints. There simply is no need to shackle the GSO FSS in the manner proposed by Motorola.

Second, from an operational perspective, Motorola's proposal is fundamentally inconsistent with a shared, co-primary use of this band by the GSO FSS. As demonstrated in Hughes's Comments, the size of the GSO FSS "exclusion zones" created by Motorola's use of the band can be extremely large, leaving large portions of the country inaccessible to GSO FSS services in this band.[9/] And, although Motorola provides no sense of the maximum number of GSO FSS terminals that it proposes to allow in the shared band, any such limitation on numbers would unduly constrain the development of GSO FSS services in this band.

[8/] In its Comments, Hughes noted that since Motorola needed to access this 50 MHz only on an occasional basis and only at two feeder link complexes---Chandler, Arizona and Hawaii---it appeared that there was a reasonable possibility of coordinating use of this 50 MHz between SPACEWAY and Iridium. Comments of Hughes at 20, n.14. Motorola now suggests without support that it needs exclusive, primary use of this 50 MHz of uplink spectrum (and the corresponding 50 MHz on the downlink) at each of its MSS feeder link sites around the country. Comments of Motorola at 15, n.18. The proposed expanded use by Iridium at six new sites could preclude sharing that spectrum with SPACEWAY.

[9/] *See* Comments of Hughes at 12-16.

Third, Motorola's proposal forestalls the ability of the GSO FSS to use this part of the 28 GHz band for its and unique primary advantage: offering both providers and users the benefits of inexpensive, unobtrusive VSATs upon which GALAXY/SPACEWAY and the recently proposed AT&T and Lockheed GSO FSS systems are based. Although Motorola provides no indication of the minimum size of the dishes that it would require, it presumably advocates relegating GSO FSS systems to the ten-foot and larger dishes that are used today at C band.[10/] Constraining the GSO FSS to large antennas would cripple the marketability, cost advantages, and competitiveness of systems like GALAXY/SPACEWAY and saddle GSO FSS systems with the types of zoning regulations from which the Commission is now striving to free them.[11/]

Finally, the crippling restrictions that Motorola proposes on the GSO FSS are unnecessary in order to allow sharing between Motorola's feeder links and the GSO FSS. As noted in Hughes's Comments, Hughes has conducted extensive analyses that

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10/ There is absolutely no basis for Motorola's bald assertion that "a sufficient number of omnipresent FSS terminals could reasonably be accommodated" in the remaining 750 MHz of primary GSO FSS spectrum. Motorola Comments at 13. The record in this proceeding and the GALAXY/SPACEWAY application clearly demonstrate that GSO FSS systems need access to 1000 MHz for small antennas (less than 1.0 meters) to provide sufficient system capacity and to be cost competitive with other services.

11/ Larger satellite antennas are subjected to greater local regulation, which can effectively preclude their use in some cases. *See* Preemption of Local Zoning Regulation of Satellite Earth Stations, IB Docket No. 95-59, FCC 95-180 (May 15, 1995) (Notice of Proposed Rulemaking). Under the Commission's proposed Section 25.104, most local regulations of satellite antennas under one meter, such as those proposed for GALAXY/SPACEWAY, will be presumed preempted if they impose more than a *de minimis* burden on users. *Id.* The record in the satellite antenna preemption proceeding indicates that the larger the antenna, the more restrictive the local regulations, and is replete with examples of local regulation precluding the use of VSATs and other satellite antennas. *See, e.g.,* Comments of Hughes Network Systems, Inc., filed July 14, 1995; Comments of Satellite Broadcasting and Communications Association of America, filed July 14, 1995.

confirm the ability of NGSO MSS systems like Iridium to solve the NGSO MSS feeder link/GSO FSS interference problem *without* restricting the scope or nature of the NGSO MSS service, *without* requiring Motorola to launch any additional satellites, and *without* precluding the use of small antennas by the GSO FSS.[12/] The sharing analysis detailed in the attached technical Appendix provides the technical bases for practical means of achieving co-equal, co-frequency sharing between NGSO MSS feeder links (such as Motorola's Iridium) and GSO FSS networks in the entire 400 MHz band designated for such use in the U.S. proposals to WRC-95. It is not a new, last-minute analysis, but was originally submitted to IWG4 of the Commission's Industry Advisory Committee in March, 1995. The present appendix merely augments that analysis by rebutting some of the objections recently raised by Motorola.

In particular, the analysis demonstrates that mutual interference between the feeder links of the proposed Iridium NGSO MSS system and the Ka band uplinks and downlinks of the proposed GALAXY/SPACEWAY GSO FSS system can be mitigated without degradation to either system. Moreover, this can be done without "exclusion zones," without minimum antenna size limitations, and without changes to the basic design or deployment of either system. Finally, the collocation of MSS feeder link and GSO FSS earth stations is explicitly assumed so that there will be no constraints on Motorola's choice of feeder link sites.

The Hughes proposal allows entry into the "shared" band by multiple satellite systems and does not constrain either the nature or scope of the services that can be offered

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12/ *See, e.g.*, Hughes Comments at 24-26. Indeed, the TRW proposal would allow the full deployment of 66 cm antennas by GSO FSS providers, without any limitation.

by GSO FSS or NGSO MSS systems. Hughes therefore urges the Commission to take the lead in requiring for domestic use in the 29.25-29.5 GHz band the same interference mitigation technique that should be imposed internationally for NGSO MSS feeder link systems throughout the 29.1-29.5 GHa band designated in the U.S. WRC-95 proposals for NGSO MSS feeder links.

In sum, Motorola's proposed restrictions are unreasonable, unnecessary and would forestall the development of competitive satellite services. Instead, the Commission should require Motorola to use its inherent power control and earth station diversity capability to mitigate interference in the shared 29.25-29.5 GHz band.

2. TRW's Sharing Proposal is Incomplete

TRW acknowledges what Hughes has long advocated: that NGSO MSS feeder link systems are uniquely suited to solving the NGSO/GSO interference problems through their ability to design and operate their systems in a manner that avoids the occurrence of geometric intersections between NGSO and GSO systems. In recognition of the problems of NGSO MSS feeder link/GSO FSS sharing, TRW has advanced ideas that it believes will facilitate shared use of the band. Hughes has engaged in a number of discussions with TRW to better understand these ideas, to assist in the development and testing of those concepts, and to begin to evaluate what types of constraints they would impose on GSO FSS use of the shared band.[13/]

Hughes applauds TRW's willingness to locate its two feeder link complexes outside the top 25 major markets and to limit the total number of MSS feeder link complexes

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13/ For example, the TRW proposal analyzes the SPACEWAY system before it was modified by Hughes' September 29, 1995 amendment. Additional work needs to be done to understand the impact on that modified Hughes proposal.

in the shared band.[14/] These types of limitations help to alleviate a difficult problem, but they do not solve the problem entirely. TRW's proposal also will create certain geographic "exclusion zones" where GSO systems cannot use the same band, it will preclude GSO FSS use of certain orbital locations around the world, and it does not address downlink band issues (i.e., sharing of the 17.7-20.2 GHz band). The impact of these restrictions needs to be quantified and understood. In addition, the affected parties need to consider how these types of constraints can be implemented in the international regulatory structure at the ITU.

Hughes appreciates the spirit of cooperation with which TRW has presented its proposal. Hughes remains willing to continue its discussions and to further study the impact and feasibility of the TRW proposal in order to better understand the full scope of the restrictions that would be imposed on GSO FSS systems. To this end, Hughes has encouraged TRW to extend its analysis to demonstrate that TRW's interference mitigation and sharing proposals can be implemented in a manner that will allow TRW's system to co-exist with a range of GSO FSS systems. Hughes intends to continue to carefully review those results. At this point, however, Hughes believes it is too early to assess the feasibility of the TRW proposal.[15/]

[14/] *See* TRW Comments at 19, n. 32 and 27, n.44.

[15/] Likewise, it is premature to respond to TRW's proposed rules until it is clear whether TRW's technical solution works.

In any event, contrary to TRW's assertion (Comments of TRW at 14), its request to use the 29.25-29.5 GHz band is not entitled to any greater weight than the request of any other proposal for the 28 GHz band filed by the September 29, 1995 filing window for 28 GHz band satellite applications. Prior to that date the Commission had not established a filing window that protected Motorola or TRW from mutually exclusive filings. *See* Comments of Hughes at 17 & n. 10. TRW and Motorola are now building their 28 GHz systems at their own risk and without reasonable reliance on any Commission authority.

B. The Two Alternatives Proposed by Hughes Remain the Only Concrete Solutions to the 29.25-29.5 GHz Band Sharing Problem

Hughes's proposals for solving the 29.25-29.5 GHz band sharing problem remain the only feasible options that clearly provide both MSS feeder links and GSO FSS systems with suitable spectrum to operate without undue constraints. In its comments, Hughes proposed two plans: reverse band working ("RBW") and a modified band plan.[16/] The reverse band working proposal offered by Hughes would accommodate feeder links for two MSS systems, resolve the current mutual exclusivity between the proposed NGSO MSS systems and the GSO FSS, and allow GSO FSS systems to operate in the 29.25-29.5 GHz band.

Unlike the Motorola and TRW proposals, RBW will not constrain any proposed system.[17/] The Hughes "RBW plan" allows one MSS system to use the 29.1-29.25 GHz band for feeder links, shared with LMDS in accordance with the agreement between CellularVision and Motorola, with the 19.3-19.45 GHz band available for downlinks. Another MSS system can use the 19.4-19.7 GHz band for feeder uplinks (employing reverse band working with the other MSS system), while it uses one of the "lower" frequency bands already proposed for feeder downlinks, such as the 15.45-15.65 GHz band. Under this proposal, both Motorola and TRW can freely operate their feeder

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16/ As an alternative to the RBW plan, Hughes proposed slight modifications to the Commission's band plan that would not change the amount of spectrum available to any service. *See* Comments of Hughes at 22-24. Rather, LMDS would be designated in two separate 500 MHz bands, one of which it would share on a co-primary basis with MSS feeder links, per the agreement between Motorola and CellularVision.

17/ Other than possibly by the creation of small "exclusion zones" for the GSO FSS that can be addressed by using different downlink bands. *See* pp. 11-16 below.

uplinks, and solve the universally-acknowledged problems created by MSS and GSO FSS sharing in the 29.25-29.5 GHz band.

The only opposition to RBW appears to come from TRW. Specifically, TRW argues that RBW is not feasible for its system because no space-qualified receive equipment exists today at 19.4-19.7 GHz, and the costs of developing that equipment would exceed $50 million and cause a six to twelve month delay in the Odyssey program. TRW provides no support for any of these assertions. More significantly, it is hard to understand why TRW is now backing down from a solution that it has advocated for over six months.

During the WRC-95 preparatory process, TRW repeatedly urged the Commission to pursue the possibility of reverse band working in the 19.4-19.7 GHz band because TRW claimed that reverse band working would be necessary in order to provide sufficient global spectrum for the implementation of multiple MSS systems.[18/] TRW introduced into both the ITU and FCC WRC preparatory processes a sharing study that showed the feasibility of using this band for NGSO MSS feeder links on an RBW basis, and it urged that the U.S. "should aggressively pursue the possibility that NGSO MSS feeder links can make bi-directional use of the spectrum in the 18.8-19.7 GHz band (i.e., in the Earth to space direction) . . . "[19/] In response to these urgings, the FCC is now pursuing RBW at 19.4-19.7 GHz as a primary objective at WRC.

TRW's nascent resistance to this spectrum-efficient manner of operations is impossible to reconcile with its prior urging the Commission to "aggressively pursue" RBW as a U.S. proposal for WRC. TRW's own analysis has demonstrated that RBW is a viable

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18/ *See* Comments of TRW, filed March 6, 1995, IC Docket No. 94-31, at 14.

19/ *Id.* at 18 & n. 32.

approach to accommodate TRW and possibly other MSS feeder link systems. There is no reason not to pursue that option now.

III. DOWNLINK BAND ISSUES

Although the current proceeding has focused to date almost exclusively on the uplink part of the Ka band (28 GHz), the Commission has asked for comments on how it should assign the corresponding downlink spectrum at 17.7-20.2 GHz to satellite systems. A number of parties have proposed that the Commission pre-assign downlink spectrum to GSO FSS satellite systems in a "non-standard" manner.[20/]

Although Motorola correctly notes that spacecraft that contain on-board processors are not significantly disadvantaged by the use of non-standard band pairing, non-standard band pairing does require certain technical complications in more typical spacecraft that contain "bent-pipe" transponders. The advanced technology of on-board processors will not be deployed or needed on every satellite that will operate at 28 GHz. For example, some of the spacecraft in the current GALAXY/SPACEWAY configuration contain "conventional" transponder designs where "standard" band pairing clearly is preferable from a technical and spacecraft cost perspective. Use of non-standard band pairing may be appropriate as a tradeoff to avoid a more significant operational constraint, but Hughes firmly believes that the use of non-standard band pairing should be left to the discretion of the satellite applicant -- not mandated by the Commission.

In particular, Hughes strongly disagrees with the downlink band proposals of TRW and Teledesic, which would significantly constrain the way in which GSO FSS systems

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20/ Traditionally, under "standard" uplink and downlink band pairing, the downlink part of the Ka band would be separated by 9.8 GHz from the uplink band. Under "non-standard" pairing, this separation may vary in different parts of the band.

can use their corresponding Ka band downlink band. TRW urges the Commission not to allow GSO FSS systems to use the 19.45-19.7 GHz band that "naturally" pairs with the shared 29.25-29.5 GHz band; rather TRW urges that the Commission *require* GSO FSS systems to use the 18.3-18.55 GHz band for downlinks.[21/] Teledesic opposes that approach and instead urges the Commission to require that GSO FSS operators pair their 29.25-29.5 GHz uplinks with downlinks at 19.3-19.425 GHz and 19.575-19.7 GHz.

The charts below help illustrate the issues presented by these proposals. They show how the downlink band pairs with the uplink band under a "standard" method of band pairing and why flexibility in spectrum pairing is needed for the GSO FSS.

UPLINK BAND (27.5 - 30.0 GHz)

27.5	28.35	28.6	29.1	29.25	29.5	30.0
LMDS fss	GSO FSS ngso fss	NGSO FSS gso fss	LMDS & MSS FEEDER LINKS	GSO FSS & MSS FEEDER LINKS	GSO FSS ngso fss	

DOWNLINK BAND (17.7 - 20.2 GHz)

17.7	18.55	18.8	19.3	19.45	19.7	20.2
FSS	GSO FSS (Subject to power limits at 18.6 - 18.8) ngso fss	NGSO FSS gso fss	MSS FEEDER LINKS & GSO FSS	GSO FSS & MSS FEEDER LINKS	GSO FSS ngso fss	

21/ In addition to the reasons set forth below for not limiting GSO FSS downlinks in this manner, if TRW's proposed interference mitigation/sharing techniques (discussed above) are able to fully solve the NGSO MSS feeder link/GSO interference problem, there would appear to be no need to limit the use by GSO FSS of the 19.45-19.7 GHz downlink band as TRW has proposed.

As shown above, under a "natural" downlink band pairing, a GSO FSS system could be subject to two types of constraints. First, as Hughes noted in its Comments, the part of the 19.3-19.7 GHz band proposed for MSS feeder link reverse band working (19.4-19.7 GHz) also would be the "natural" downlink band for GSO FSS operations at 29.25-29.5 GHz. Even with MSS feeder links operating in the reverse direction of the GSO FSS in this part of the band, some type of geographic exclusion zones still would likely exist around the MSS feeder link station that could preclude nearby GSO FSS operations.[22/] Thus GSO FSS operators may desire to avoid operations in this part of the downlink band and instead to "pair" their 29.25-29.5 GHz uplink with a different part of the downlink band.

Second, as Motorola and Teledesic correctly note, the 18.6-18.8 GHz part of the downlink band is subject to certain power limits that protect the Space Sciences. The existence of the power limits at 18.6-18.8 GHz was a significant enough problem to cause the Commission to revise its proposed band plan so that the NGSO FSS did not operate in that band. Moreover, the GALAXY/SPACEWAY system, as presently proposed, would exceed these limits if it were required to operate at 18.6-18.8 GHz.[23/] These power limits are currently being reviewed by an international study group, and the restrictions may become even more severe on the GSO FSS.

22/ *See CPM Report on technical, operational and regulatory/procedural matters to be considered by the 1995 World Radio Communication Conference* ("CPM Report") at 45-50.

23/ Application of Hughes Communications Galaxy, Inc. for GALAXY/SPACEWAY, filed Sept. 29, 1995, at 53-54. Teledesic is simply wrong when it concludes that these power limits are not as problem for GALAXY/SPACEWAY. Hughes first told the Commission these limits might be a problem when the band plan was being formulated in July 1995. *See* Letter from counsel to Hughes Communications Galaxy, Inc. to Lisa B. Smith, Legal Advisor, Office of Commissioner Barrett, filed in this proceeding on July 3, 1995.

It is too early to tell whether the existence of exclusion zones in the RBW band at 19.4-19.7 GHz and the power limits at 18.6-18.8 GHz warrant the use of the 17.7-18.55 GHz band by GSO FSS downlinks to solve these problems. It is clear, however, that allowing the GSO FSS the flexibility to use alternate spectrum in the downlink band will provide a suitable way to avoid these potential conflicts. Significantly, 850 MHz of alternate spectrum in the downlink band will be readily available should GSO FSS systems choose to use it. Because of the clear incompatibility of LMDS and FSS service in the uplink band,[24/] 850 MHz of the corresponding downlink band at 17.7-18.55 GHz would be "orphaned" and therefore uncommitted to any particular domestic use. Thus, GSO FSS applicants who desire to avoid either downlinks in the 19.45-19.7 GHz band shared with NGSO MSS feeder links or the power limits at 18.6-18.8 GHz should be free to seek authority to use a different 250 MHz or 200 MHz of downlink spectrum in the 17.7-18.55 GHz range.

Teledesic urges the Commission to deny the GSO FSS access to this 850 MHz of spectrum in order to "preserve the availability of the 27.5-28.35 GHz band on a secondary basis for gigalink terminals and gateways for NGSO satellite systems like Teledesic."[25/] Teledesic's proposal is a groundless attempt to try to protect Teledesic's decidedly secondary feeder links terminals and therefore should be dismissed outright. Contrary to Teledesic's

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24/ *See* Section VI. B. below.

25/ Comments of Teledesic at 8. Curiously, at the same time that Teledesic argues that GSO FSS is adequately taken care of under the band plan because it will have access to 2.35 GHz of the 28 GHz band, Teledesic seeks to foreclose GSO FSS use of 850 MHz of that band by its artificial band pairing proposal. Comments of Teledesic at 7. Of course, Teledesic also conveniently skews the facts: only 1000 MHz actually would be available to the GSO FSS on a guaranteed, primary basis, the remaining 1.35 GHz *might* be available on a secondary basis.

suggestion, the Commission has *not* suggested excluding the GSO FSS from the 27.5-28.35 GHz uplink band or the corresponding downlink band at 17.7-18.55 GHz. Rather, the Commission has explicitly noted that it is possible for GSO FSS gateways to share the 27.5-28.35 GHz band with LMDS.[26/]

Teledesic has concluded that its gigalink terminals are *fully capable* of operating on a *secondary* basis to the GSO FSS. There is no reason that Teledesic's system should be given exclusive access to any more than the 500 MHz that already has been set aside for its exclusive use under the current band plan. Teledesic's position on GSO FSS downlinks at 17.7-18.55 GHz also is impossible to reconcile with its repeated comments that the operation of its NGSO FSS downlinks below 18.8 GHz is "unworkable" or "not technically feasible."[27/]

In light of the issues addressed above, there is no basis for restricting access by GSO FSS systems to the 17.7-18.55 GHz part of the downlink band. Access to the 17.7-18.55 GHz band by the GSO FSS may be needed to allow the Commission to implement RBW in order to accommodate MSS feeder links at 19.4 - 19.7 GHz. And Teledesic's artificial band pairing proposal must be rejected because it could forestall use of RBW to solve the greater problem -- NGSO MSS feeder link/GSO FSS sharing. In sum, GSO FSS systems must have the flexibility to use the 17.7 -18.55 GHz downlink spectrum due to the constraints they face in the rest of the downlink band that will be available to them. The Commission should continue to provide the GSO FSS the ability to use this 850 MHz of downlink spectrum in the manner that best meets their needs.

[26/] Third Notice at ¶ 39 & n. 37.

[27/] Comments of Teledesic at iii, 19-21 & n.13.

IV. MSS SERVICE LINK ALLOCATIONS IN THE KA UPLINK BAND

In response to the Commission's inquiry about the use of the 29.5-30.0 GHz band for MSS service links, Hughes noted that absent implementation of interference mitigation techniques, it is unlikely that MSS service links and FSS systems can share that 500 MHz due to the ubiquitous nature of both MSS and FSS receive and transmit equipment.[28/] Allowing co-primary MSS service link operations in the 29.5-30.0 GHz band prior to the implementation of appropriate sharing criteria could threaten the ability of GSO FSS systems to use a full one-half of the 1000 MHz that the Commission proposes to set aside for them. In its Comments, Hughes therefore supported either the deletion in the U.S. allocation table of the allocation for MSS at 29.5-30.0 GHz, or, at a minimum, the reduction of this allocation to a secondary basis.

After further analysis, Hughes has refined its recommendation. Hughes still is concerned that the introduction of *even a single* incompatible MSS system at 29.5-30.0 GHz could reduce by 50% the amount of 28 GHz spectrum available for GSO FSS service and therefore leave insufficient spectrum to support any GSO FSS system. Any such development would upset the careful balance in the current plan. However, it may be possible for MSS and FSS to exist at some time in the future if appropriate sharing criteria are adopted, and the Commission should not foreclose that possibility. Thus, rather than changing the current MSS allocation in the 29.5-30.0 GHz band, Hughes believes the Commission should decline to license any MSS use of this band unless and until MSS use is made compatible with FSS use through the development of appropriate sharing criteria.

28/ Comments of Hughes at 28.

Hughes has similar concerns with Teledesic's new proposal to allow the 28.6-29.1 GHz band to be used for MSS as well as FSS use.[29/] It is premature to consider licensing MSS in this band until the ITU and FCC have been able to study the extent to which NGSO FSS and GSO FSS can share the same band. Even though GSO FSS use of this band may be limited to use on a secondary basis, there still may be valuable uses of this band for the GSO FSS. In fact, an ITU-R study group has been formed to address this question and Hughes has done work that supports the feasibility of sharing between Teledesic and the GSO FSS under certain conditions. But the introduction of an NGSO MSS service in this band could foreclose GSO FSS services that otherwise would be permitted under the Commission's plan. Until the Commission has determined that GSO FSS systems *cannot* share this band with the NGSO FSS, the Commission should not change this allocation in a manner that could foreclose GSO FSS use of the proposed 500 MHz NGSO FSS band at 28.6-29.1 GHz.

V. THE COMMISSION'S PROPOSED BAND SEGMENTATION PLAN ADEQUATELY ACCOMMODATES FIXED POINT-TO-POINT SERVICES

During the course of these proceedings, the Commission has been presented with myriad proposals for use of the 28 GHz band, including the point-to-point uses urged by Digital Microwave Corporation ("Digital") and Harris Corporation-Farinon Division ("Harris").[30/] Like other potential applicants for 28 GHz band services, Digital and Harris have submitted numerous comments and pleadings -- including a proposed channelization plan -- and have participated as part of the Negotiated Rulemaking Committee.

29/ *See* Comments of Teledesic at 19-21.

30/ *See* Third Notice at ¶¶ 51-52.